



UiO : Department of Chemistry  
University of Oslo

# Biogenic VOCs over the Southeastern and Southcentral US

Armin Wisthaler and Tomas Mikoviny

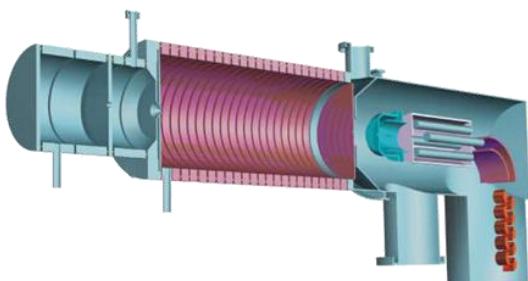


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AEROSPACE



SEAC4RS Science Team Meeting, Boulder - April 17, 2014

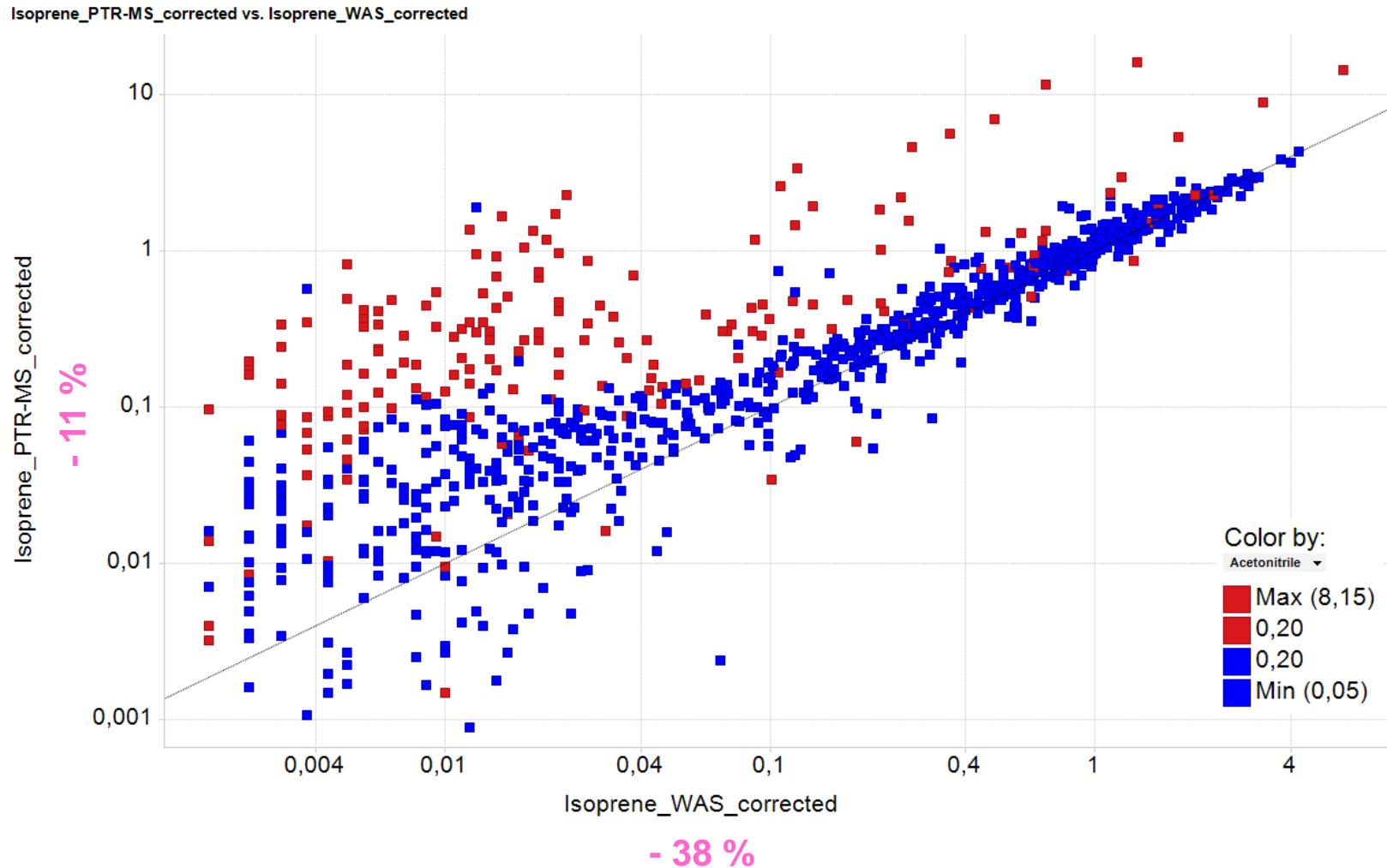
# PTR-MS aboard the DC-8



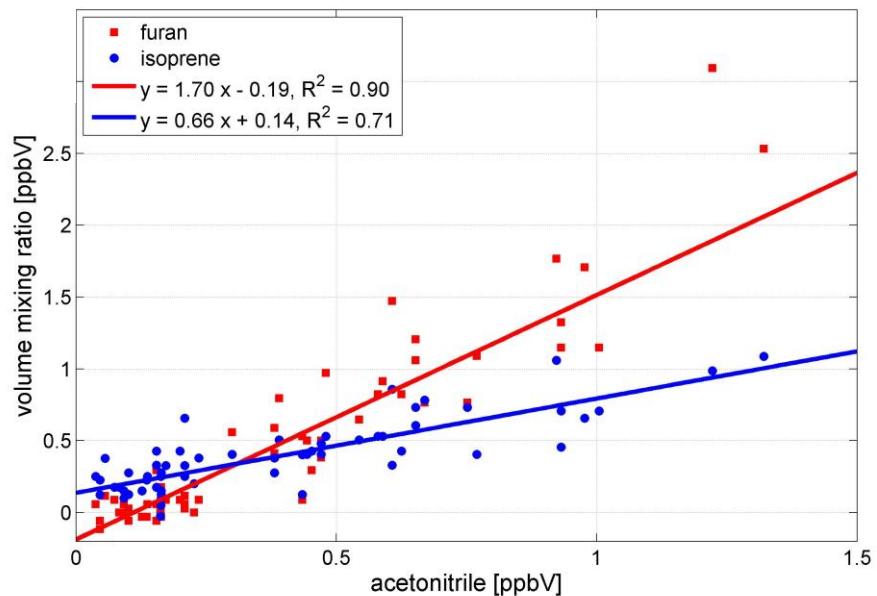
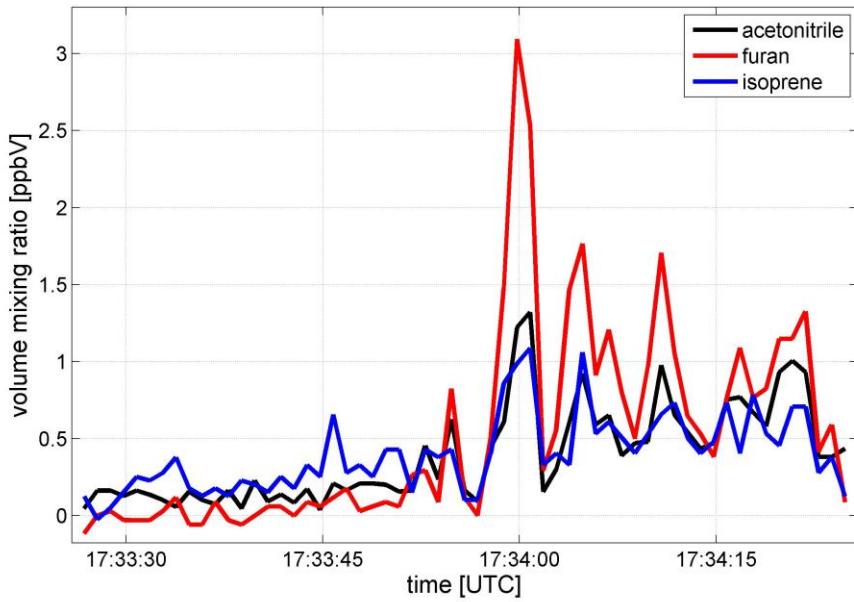
m/z	assignment
<u>33</u>	methanol
<u>42</u>	acetonitrile
<u>45</u>	acetaldehyde
<u>59</u>	acetone, propanal
(61)	(acetic acid, glycolaldehyde)
<u>69</u>	<b>isoprene, furan</b> (MBO) (pentadienes, methylbutadienes)
<u>71</u>	<b>methyl vinyl ketone (MVK)</b> <b>methacrolein (MACR)</b>
79	benzene
<u>93</u>	toluene
<u>137</u>	monoterpenes

field data produced

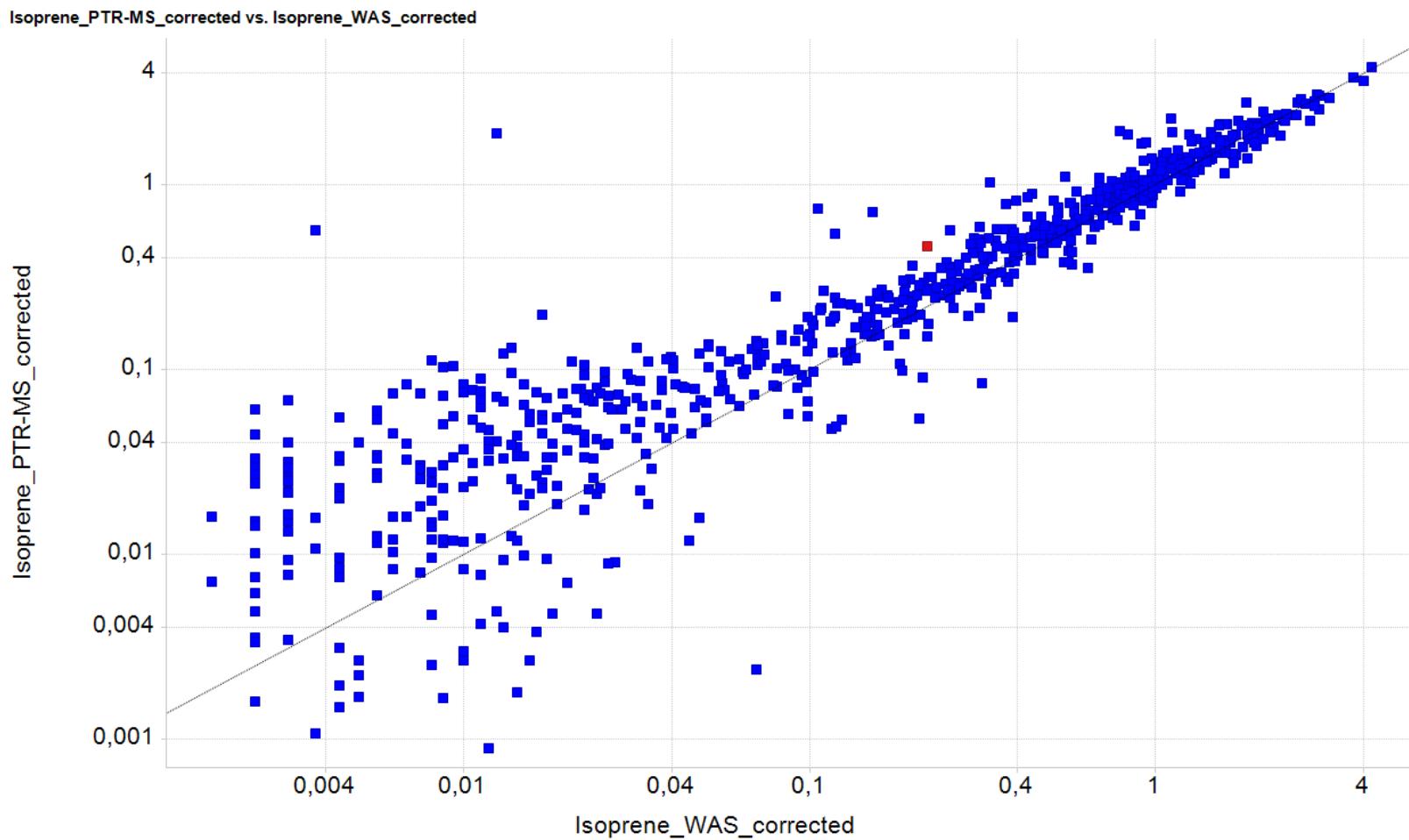
# Isoprene (m/z 69) – recalibration of field data



# Isoprene (m/z 69) – furan interference in BB plumes



# Isoprene (m/z 69) – offset

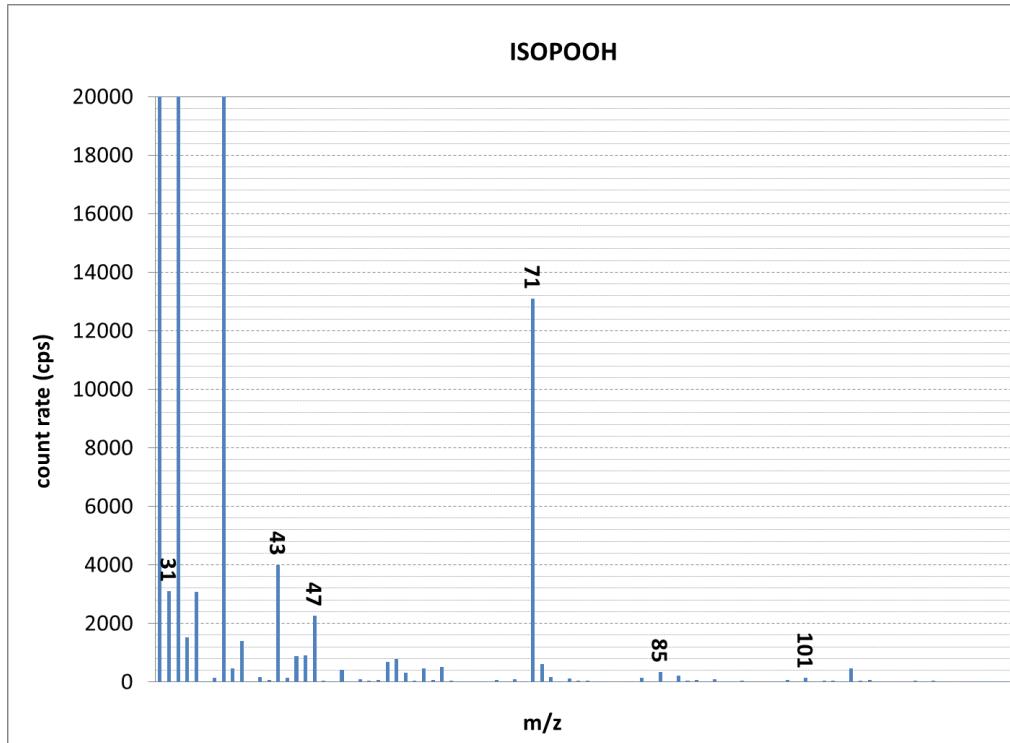


## Filter Settings

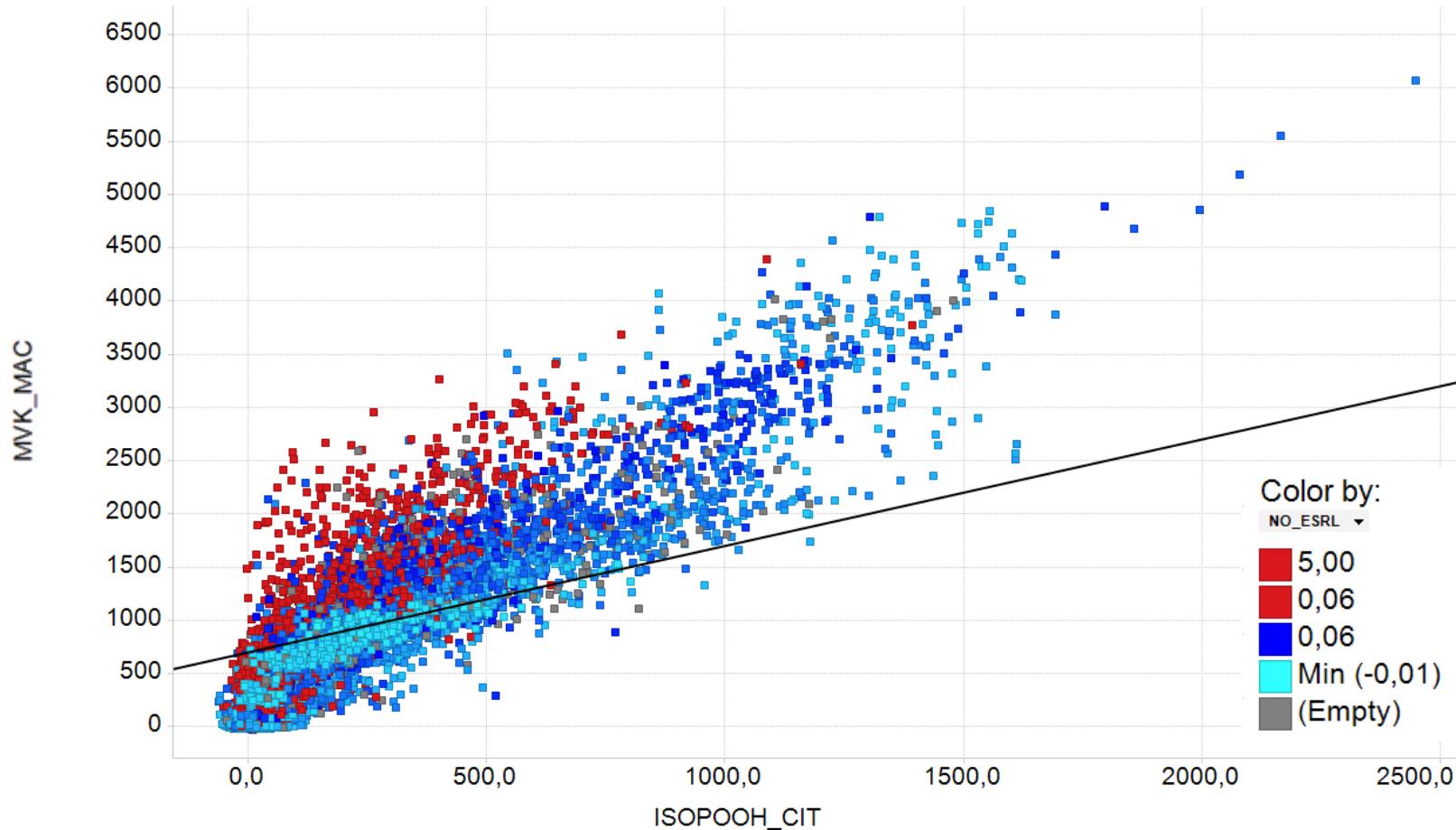
- Acetonitrile: (0,05 <= Acetonitrile <= 0,20)

# MVK+MACR ( $m/z$ 71)

- Recalibration of field data: - 30 %
- ISOPOOH interference (credit to P. Wennberg, J. Crounse, F. Keutsch)
  - ISOPOOH  $\rightarrow$  MVK + HCHO (PTR-MS, GC; *what about HCHO sensors ?*)
  - current hypothesis, work in progress



# m/z 71: MVK + MACR + ISOPOOH ?



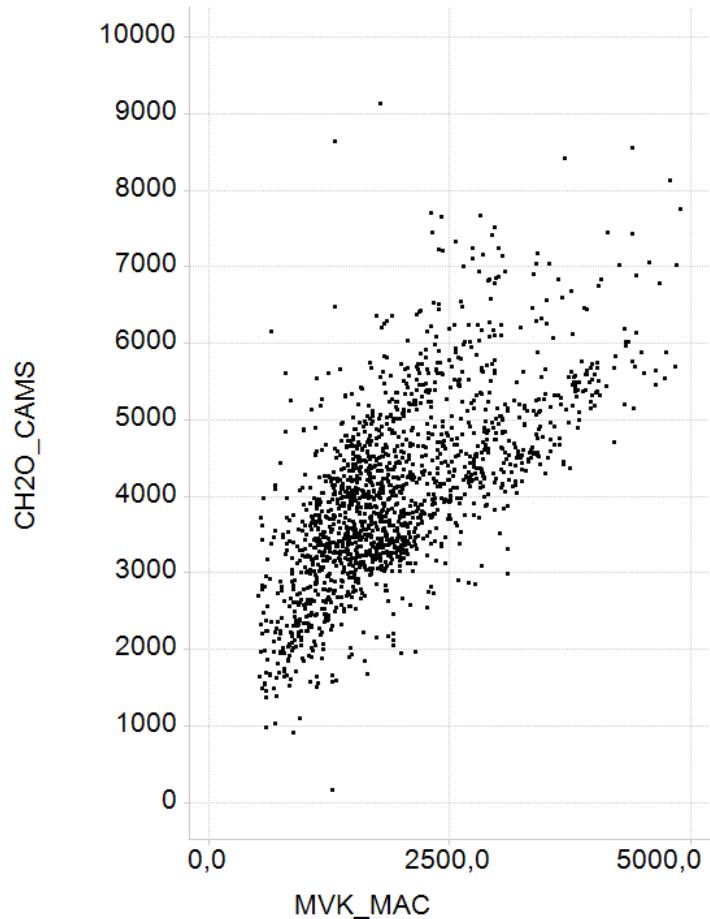
## Filter Settings

10 second merge (09.04.2014)

- GPS\_ALT: (-0,03 <= GPS\_ALT <= 3,00) without empty values
- NO\_ESRL: (-0,01 <= NO\_ESRL <= 80,88) and empty values
- Acetonitrile (ppbV): (0,02 <= Acetonitrile (ppbV) <= 0,22) and empty values

# HCHO vs. MVK+MACR

CH<sub>2</sub>O\_CAMS vs. MVK\_MAC

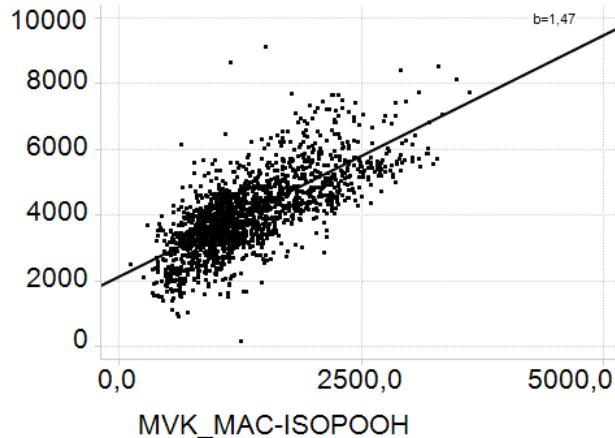


## Filter Settings

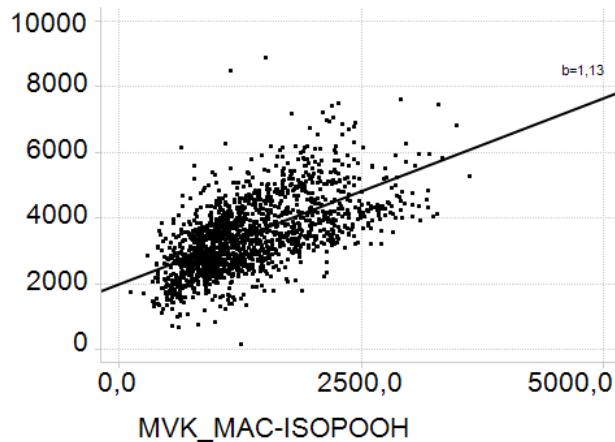
10 second merge (09.04.2014)

- ISOPOOH\_CIT: (-80,20 <= ISOPOOH\_CIT <= 2448,20) without empty values
- Acetonitrile (ppbV): (0,02 <= Acetonitrile (ppbV) <= 0,22) and empty values
- MVK\_MAC: (500,00 <= MVK\_MAC <= 34685,26) and empty values
- Isoprene\_PTR-MS\_corrected (ppbV): (1000,00 <= Isoprene\_PTR-MS\_corrected (ppbV) <= 25289,35) and empty values

CH<sub>2</sub>O\_CAMS

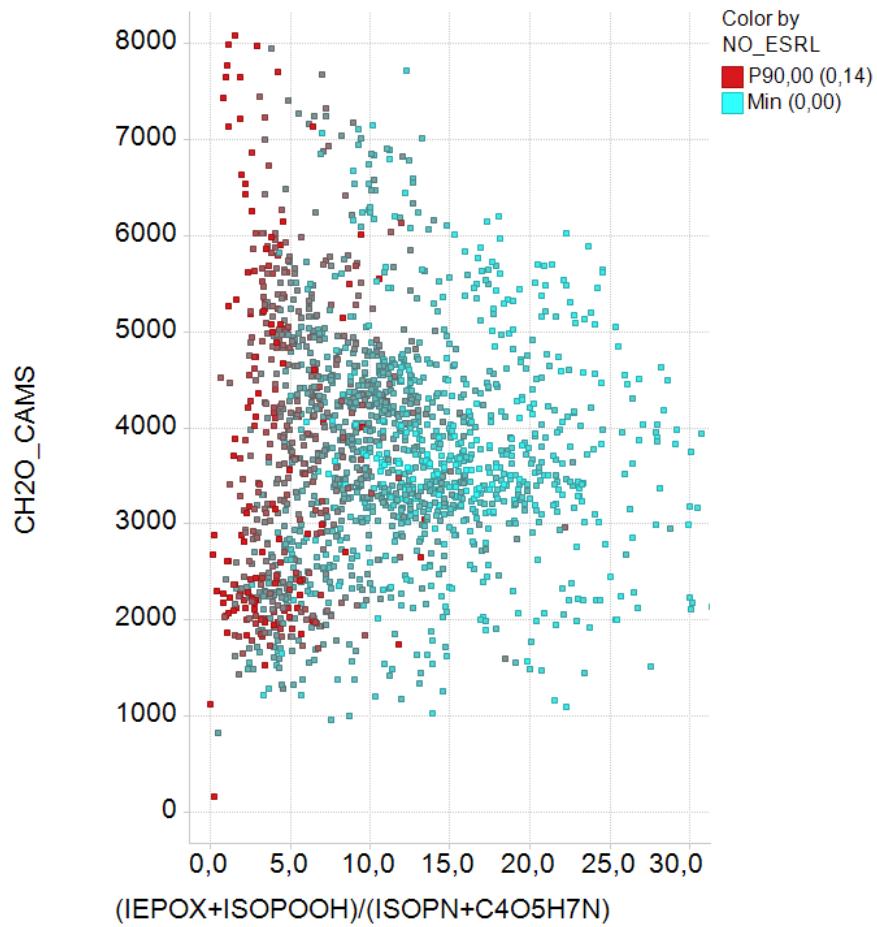


CH<sub>2</sub>O\_CAMS-ISOPOOH

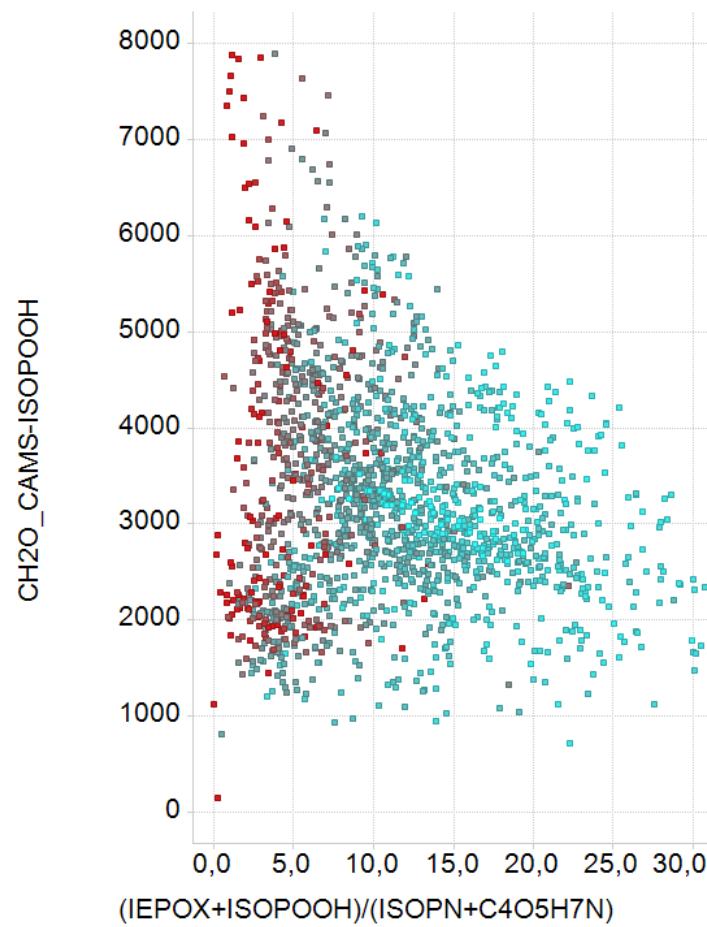


# HCHO (high NO<sub>x</sub> / low NO<sub>x</sub>)

CH<sub>2</sub>O\_CAMS vs. (IEPOX+ISOPOOH)/(ISOPN+C4O5H7N)



CH<sub>2</sub>O\_CAMS-ISOPOOH vs. (IEPOX+ISOPOOH)/(ISOPN+C4O5H7N)



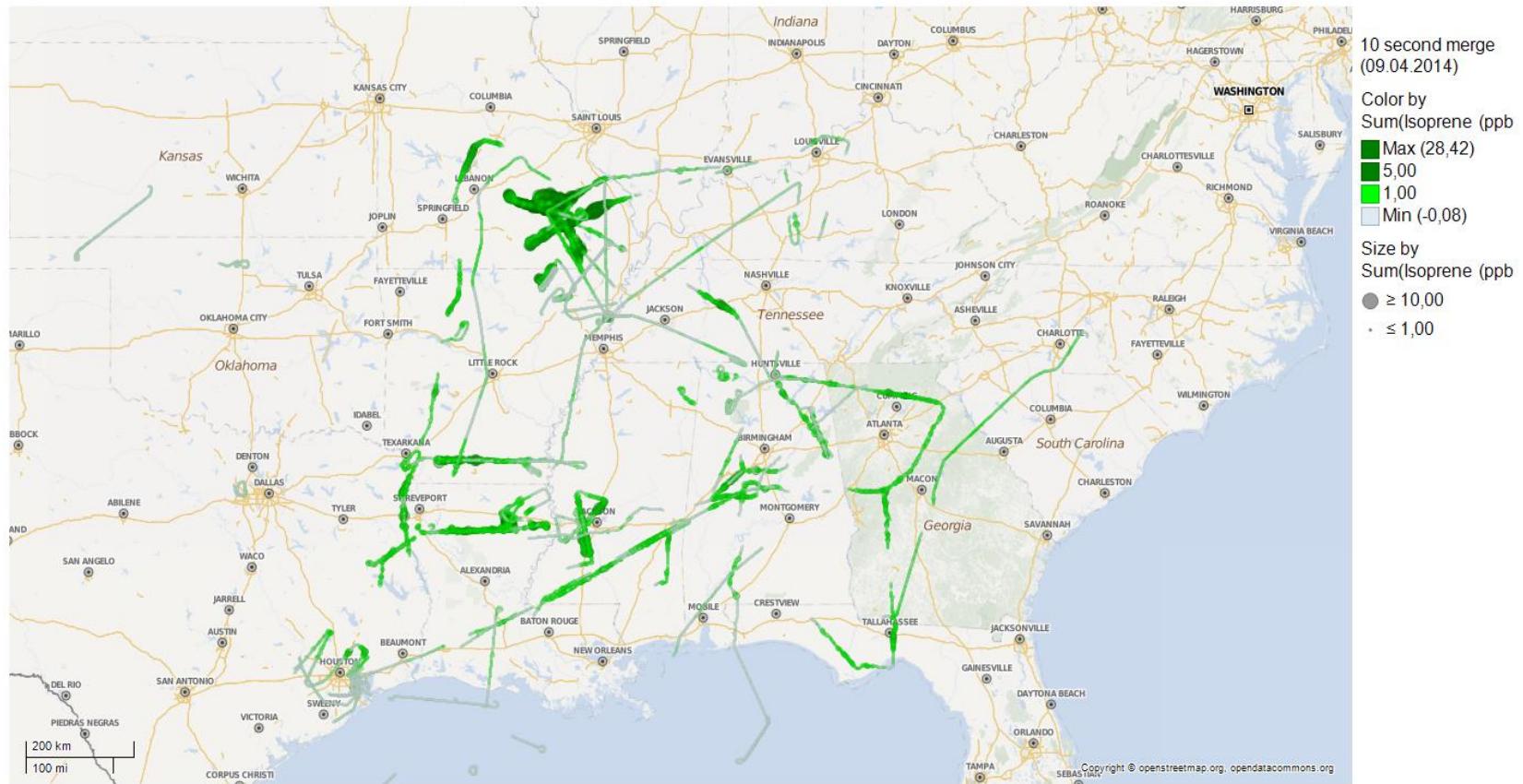
## Filter Settings

10 second merge (09.04.2014)

- Acetonitrile (ppbV): (0,02 <= Acetonitrile (ppbV) <= 0,22) and empty values
- MVK\_MAC: (500,00 <= MVK\_MAC <= 34685,26) and empty values
- Isoprene\_PTR-MS\_corrected (ppbV): (1000,00 <= Isoprene\_PTR-MS\_corrected (ppbV) <= 25289,35) and empty values

# Isoprene

## Map Chart

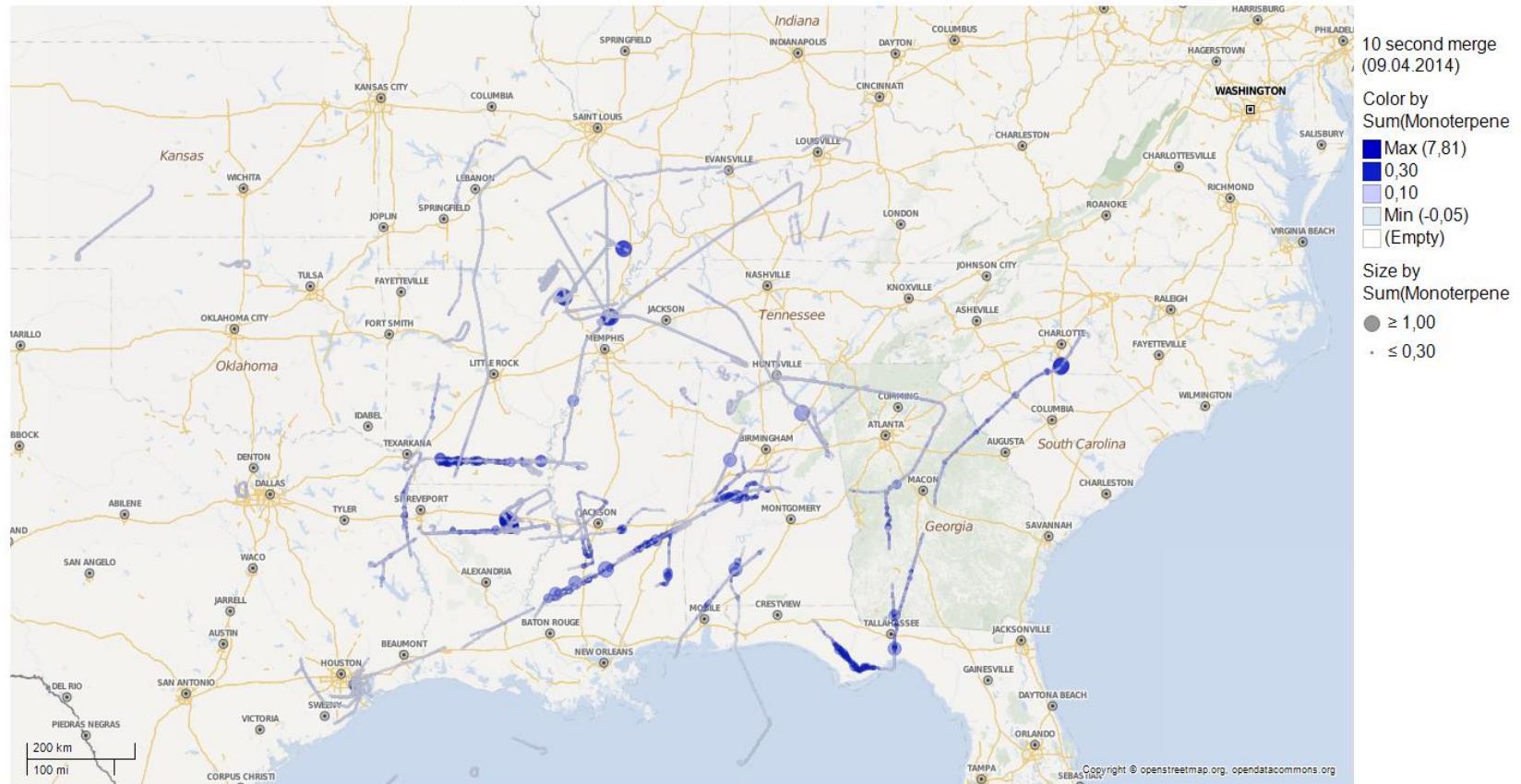


## Filter Settings

- GPS\_ALT: (-0,03 <= GPS\_ALT <= 2,00) without empty values
  - Isoprene (ppbV): (-0,10 <= Isoprene (ppbV) <= 28,42) without empty values

# Monoterpenes

Map Chart



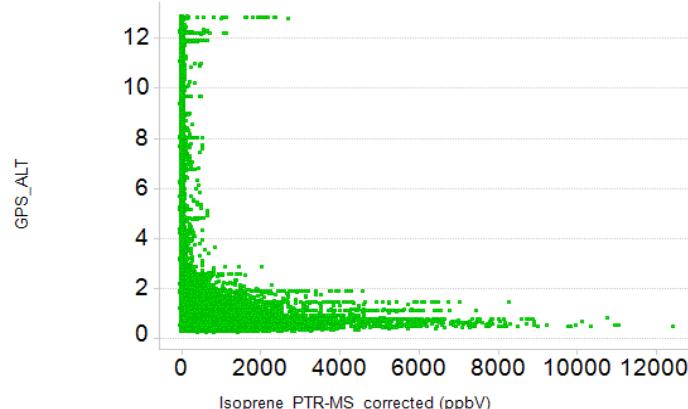
## Filter Settings

- GPS\_ALT: (-0,03 <= GPS\_ALT <= 2,00) without empty values
- Isoprene (ppbV): (-0,10 <= Isoprene (ppbV) <= 28,42) without empty values

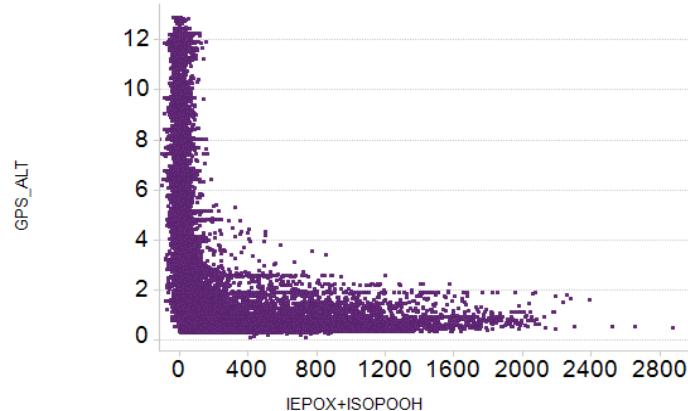
Apalachicola National Forest - Southeastern conifer forests - longleaf pine

# Vertical distribution

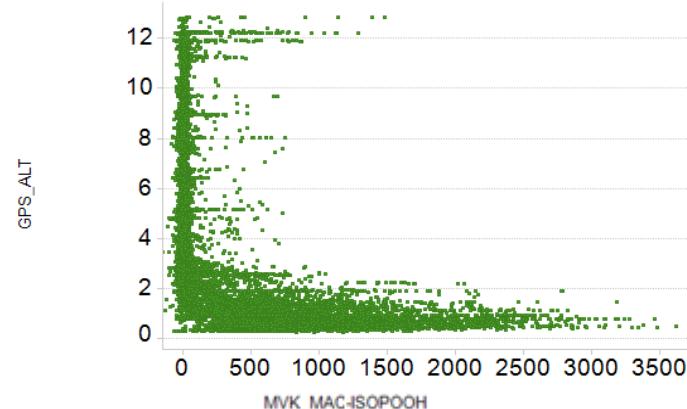
GPS\_ALT vs. Isoprene\_PTR-MS\_corrected (ppbV)



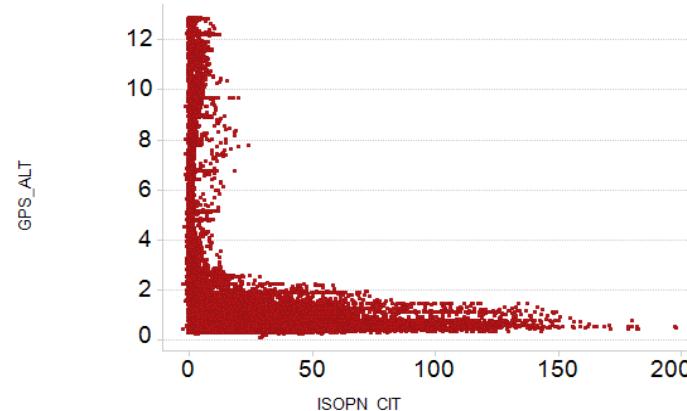
GPS\_ALT vs. IEPOX+ISOOPOOH



GPS\_ALT vs. MVK\_MAC\_corr-ISOOPOOH



GPS\_ALT vs. ISOPN\_CIT

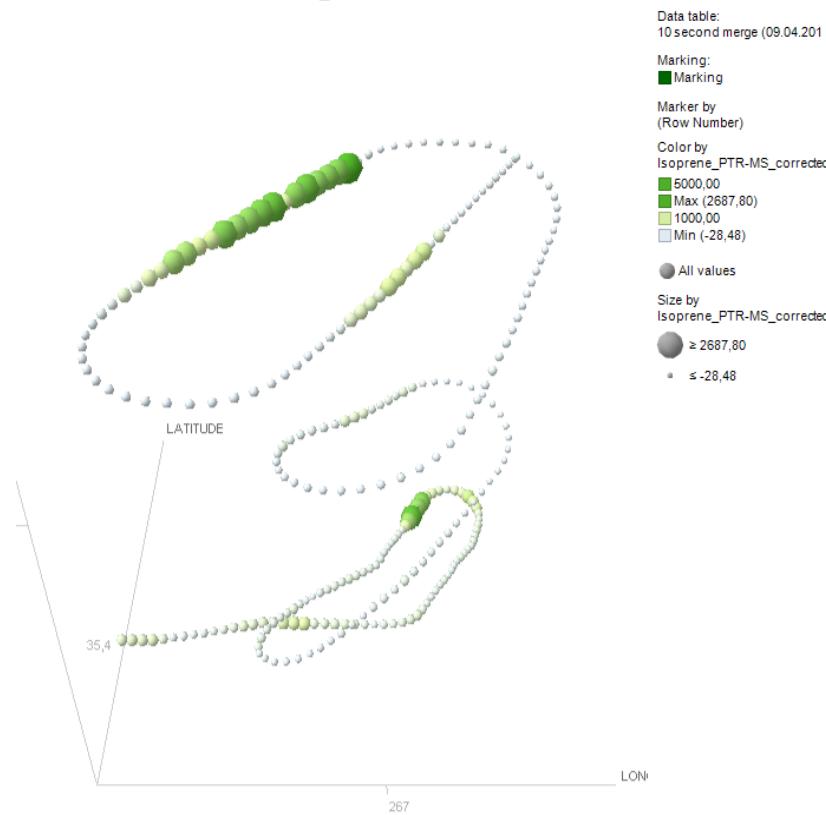


## Filter Settings

- LATITUDE: (29,73 <= LATITUDE <= 50,21) without empty values
- LONGITUDE: (264,60 <= LONGITUDE <= 279,75) without empty values
- Acetonitrile (ppbV): (0,02 <= Acetonitrile (ppbV) <= 0,22) and empty values

# Convective event (Sep 11)

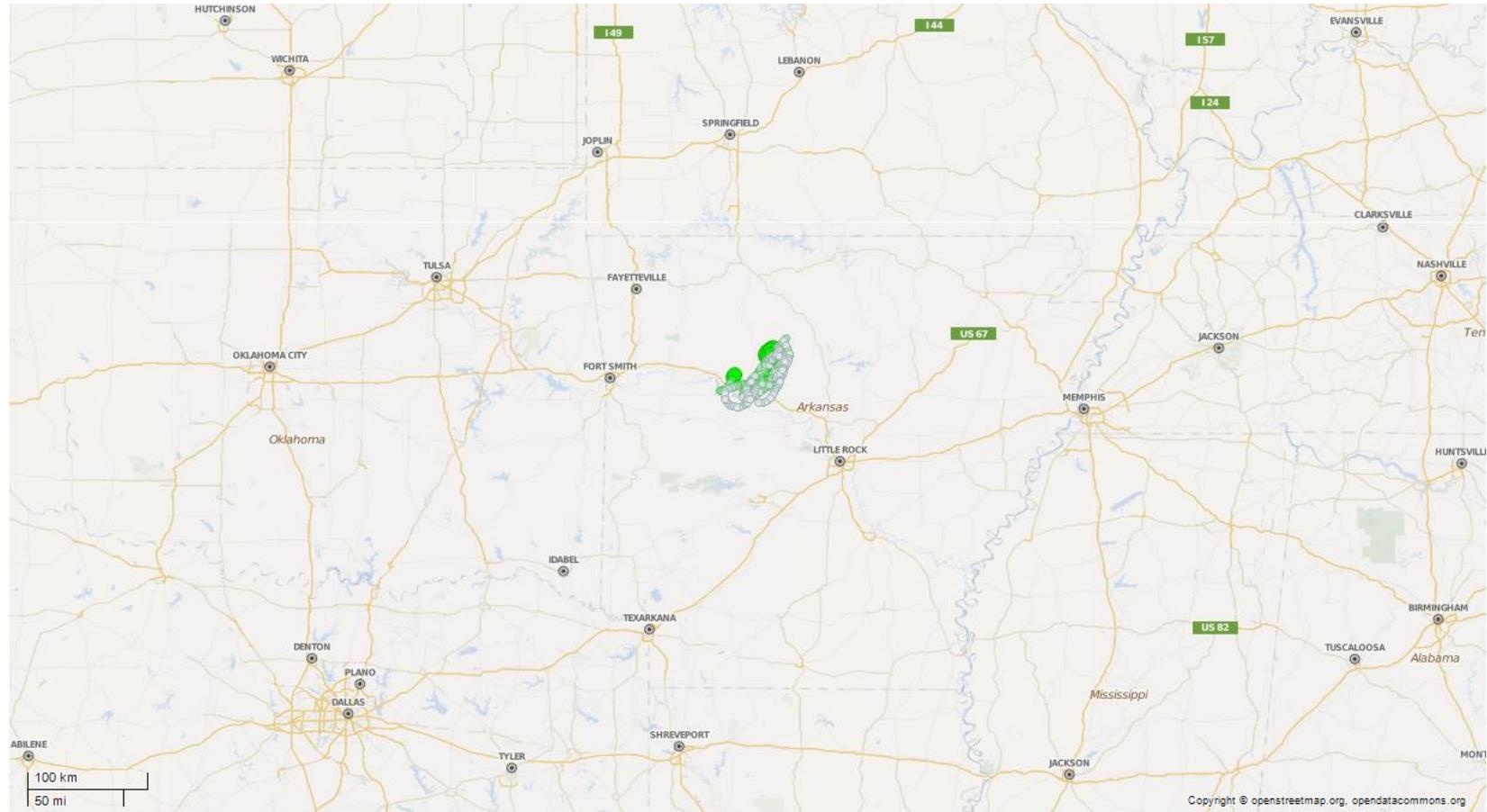
LONGITUDE vs. LATITUDE and GPS\_ALT



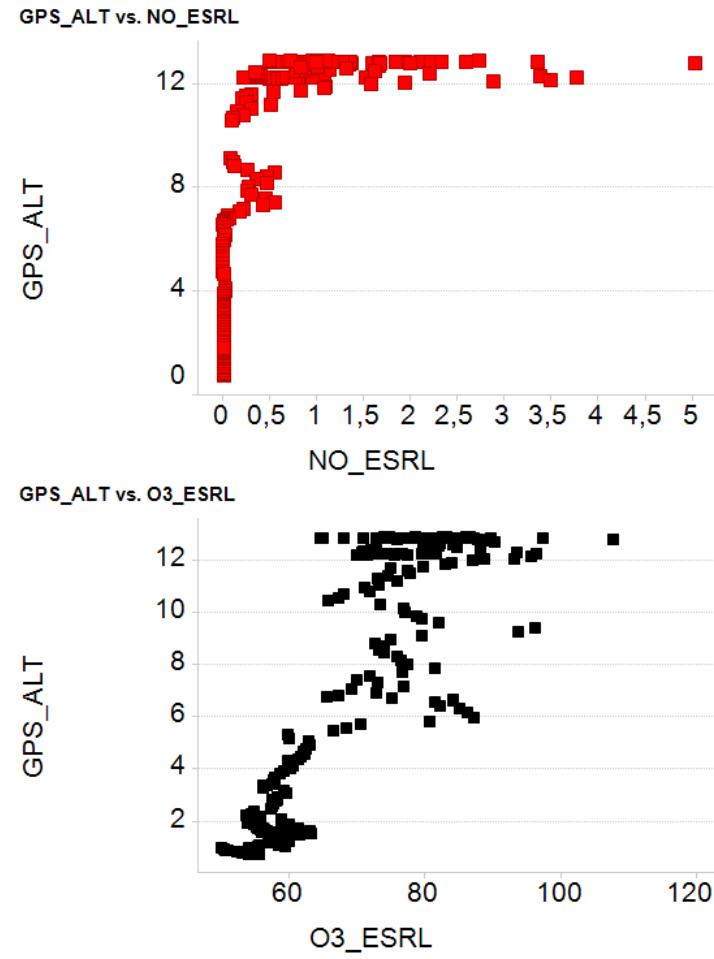
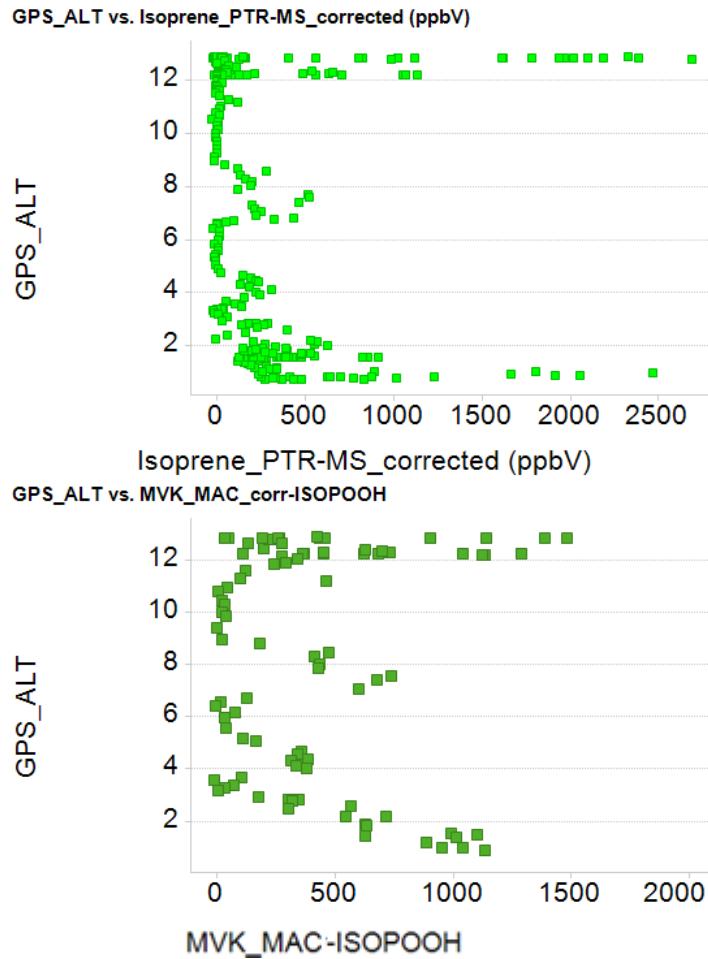
LONGITUDE vs. LATITUDE and GPS\_ALT



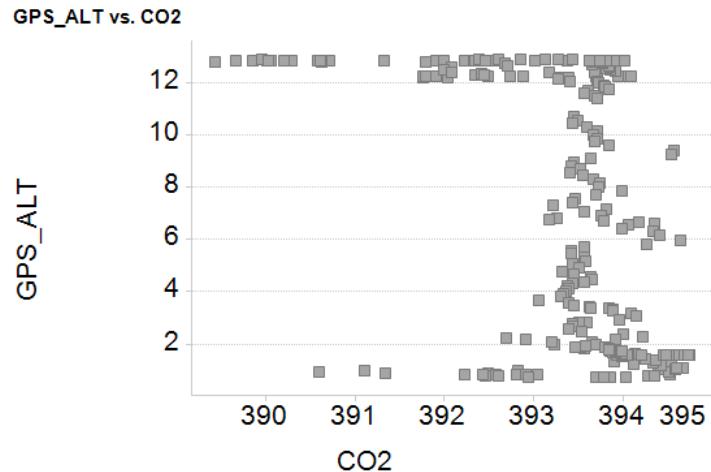
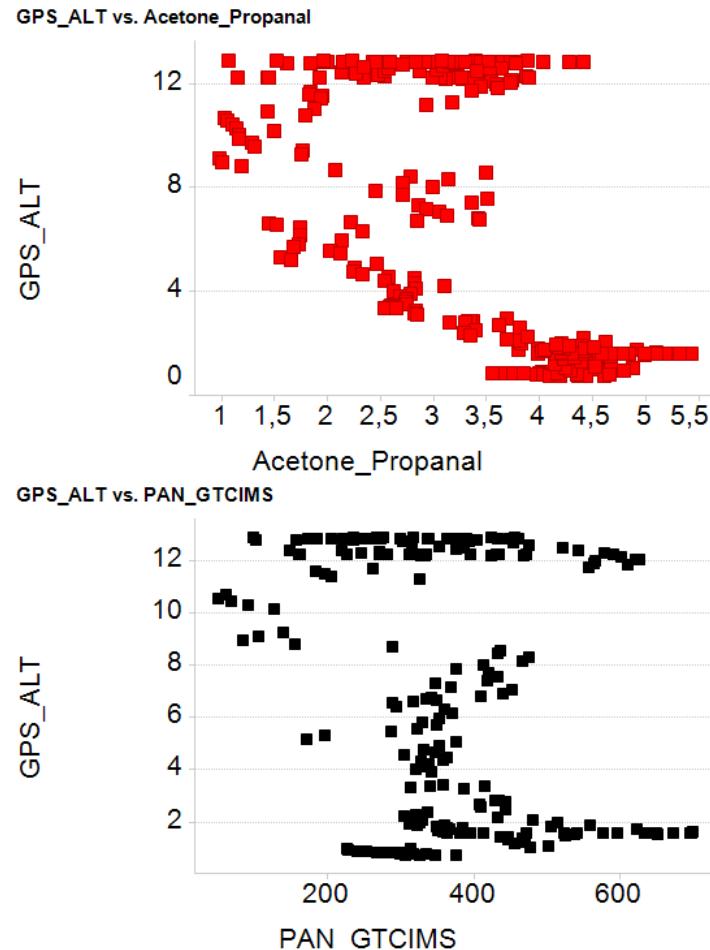
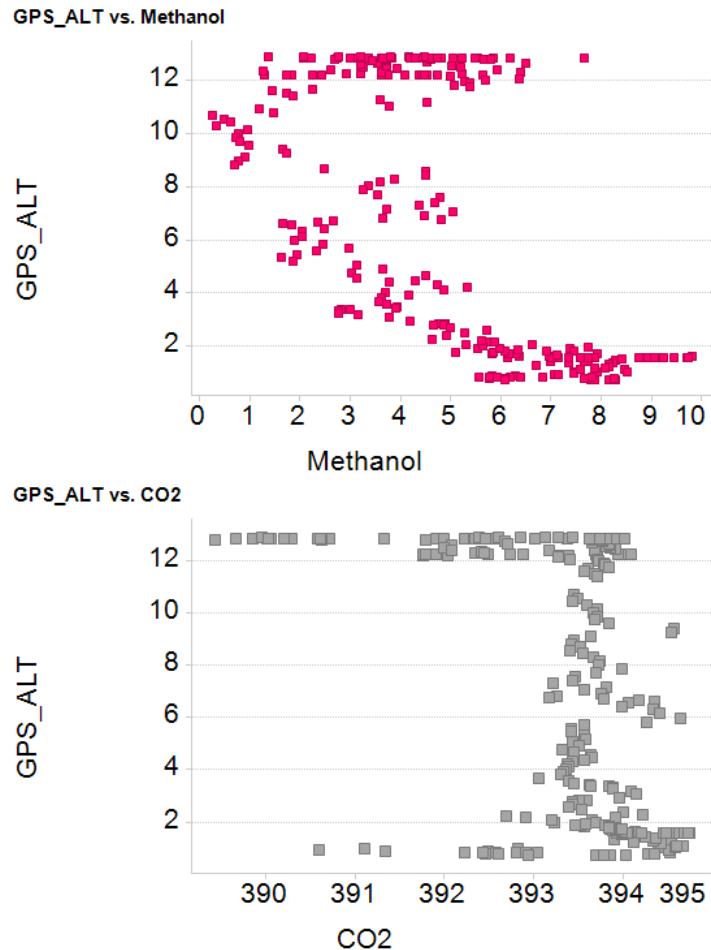
# Convective event (Sep 11, Ozarks, AK)



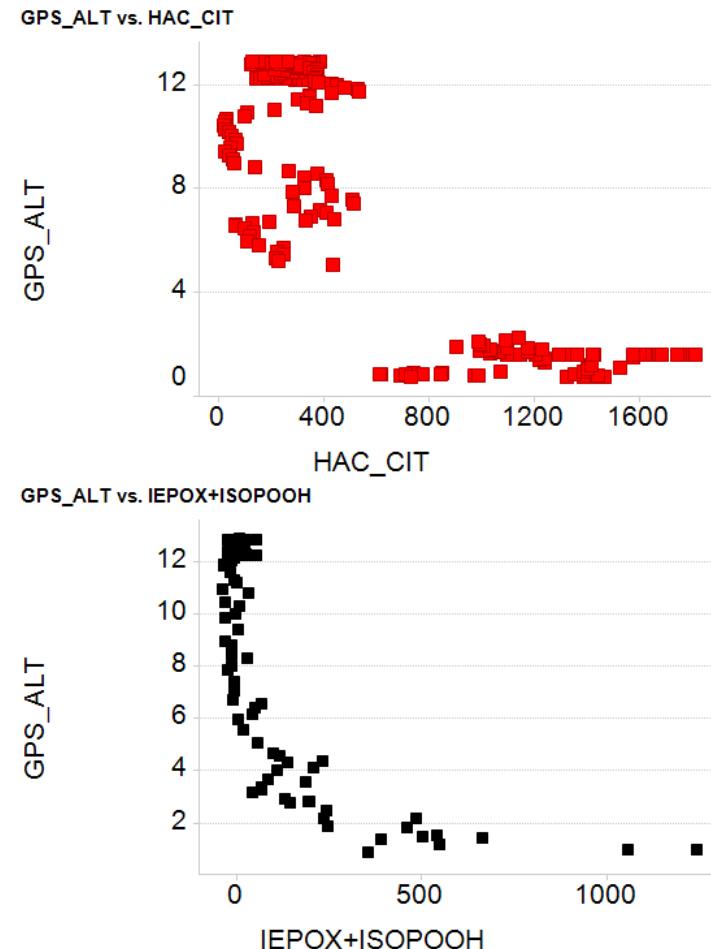
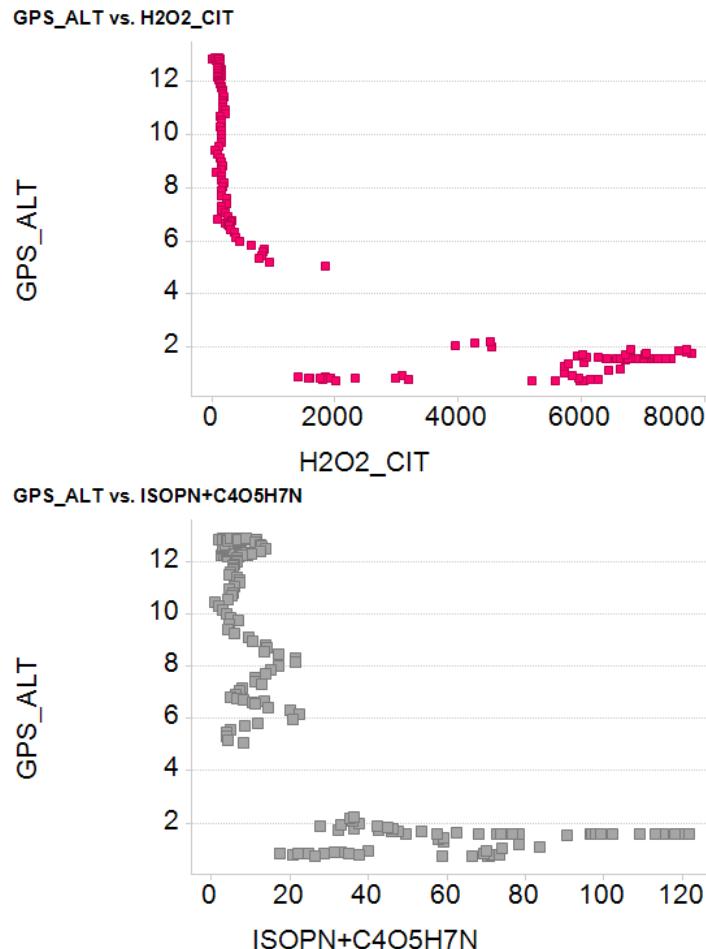
# Isoprene



# Unsoluble species



# Soluble species



# Notes for data users

## **Isoprene:**

- PTR-MS and WAS data are in good agreement after recalibration of the field data.
- PTR-MS data suffer from a known furan interference in BB plumes. Use acetonitrile data (< 0.2 ppbV) to exclude these data.
- Be cautious in drawing conclusions from data < 100 ppt.

## **MVK/MACR:**

- Recalibration of the field data reduces levels by ~ 30 %.
- The currently available data indicate that ISOPOOH gets (quantitatively) converted into MVK and HCHO on instrumental surfaces. This affects PTR-MS and GC instruments, and perhaps even HCHO sensors.
- There is much work in progress to characterize these analytical problems. Be patient !